A5510-11

November 1990

I.R.I.'S 1991 R&D TRENDS SURVEY

1991 will see increasing top management attention to R&D and a greater business focus in resource allocations.

Despite uncertainties in the U.S. economy, 41% of the companies responding to the I.R.I.'s annual survey of trends in industrial R&D indicated that they will spend at least 6% more on R&D in 1991 than in 1990. Only 16% indicated that they expect to decrease their 1991 expenditures. This represents the 7th consecutive year that an overwhelming number of respondents have planned to maintain or increase their R&D budgets. It also represents some improvement over last year's projections in which 36% of the respondents expected an increase of 6% or more.

Whether this optimism will translate to significant overall increases in industrial R&D spending is questionable, however, because the survey indicates that the respondents' combined R&D as a percent of sales is not expected to change from 1990 to 1991. A sluggish economy, therefore, would restrain actual R&D spending increases. It appears that the respondents may share this view because, on average, they have not projected manpower increases between 1990 and 1991.

Allocation of R&D resources, however, is likely to change in 1991. A shift is projected toward the support of existing businesses and new business projects, and this shift appears to be somewhat at the expense of directed basic research. Thirty percent of the respondents expect a decrease in their basic research allocations next year while less than half that number expect an increase. This compares to 40% of the respondents who predict a shift toward new business projects and 29% of the respondents also projected an increase in the amount of R&D applied to outside technical service efforts.

This increased business focus may explain the projected shift by 19% of the responding companies away from centralized corporate R&D and toward divisional R&D. Only 10% of the respondents foresee greater centralization in 1991. The shifting focus also correlates with the projections that top management will continue to pay increasing attention to R&D, both with respect to research on longer term or strategic issues and to development efforts. The increase in top management attention to development represented the biggest expected year-to-year change of any item in the survey, with 55% of the respondents forecasting an increase.

The I.R.I.'s seventh annual survey of industrial research trends was conducted during August 1990 by sending questionnaires to the official representatives of 260 U.S. member companies. Replies were received from 137, 18 more than last year, a 53% response. Respondents were asked to estimate the relative change in levels between 1990 and 1991 in Expenditures, Effort Allocation, Personnel Trends, and Other Trends.

The survey on which this article is based was conducted by the I.R.I. Research-on-Research Committee, with the assistance of Celia Brown and Pat Tiede of the I.R.I. staff. The article was prepared by Philip H. Brodsky of Monsanto Company, chairperson of the Research-on-Research Committee.

Table 1. Forecast of 1991 Trends by Industry

	R&D as % of Sales		Operational Cost per R&D Prof. (X $000)		Capital Expenditures for R&D as % of budget			R&D Profs. as % of total R&D	
	1990	1991	1990	1991	1989	1990	1991	1990	1991
Chemicals & Plastics (26 Companies)	3.7	3.7	150	156	11.9	14.5	13.9	57	57
Food, Tobacco & Kindred Products (1? Companies)	1.0	1.2	141	146	8.1	8.5	9.8	61	61
Petroleum & Related Industries (8 Companies)	4.3	4.4	221	223	11.2	11.3	10.9	54	55
Primary Metal Industries (11 Companies)	0.9	0.9	155	156	6.1	8.5	8.7	50	50
Machinery, Except Electrical (5 Companies)	4.5	4.6	167	169	10.2	12.4	9.9	52	55
Pharmaceuticals & Personal Care Products (16 Companies)	9.5	9.2	145	153	20.5	27.1	29.3	57	57
Electrical Machinery, Equipment & Supplies (6 Companies)	7.5	7.1	148	157	14.1	12.1	15.3	49	56
Paper & Allied Products (6 Companies)	1.1	1.1	142	145	13.9	16.7	12.7	53	54
Fabricated Metal Products (5 Companies)	1.5	1.6	111	115	7.5	7.6	8.1	67	68
Other (43 Companies)	6.6	6.4	178	180	14.9	16.9	15.8	59	58

As in previous years, a scale of 1-5 was used, with 1 representing "significantly less" (-5% or less), 2 "slightly less" (0 to 5%), 3 "approximately the same" (1 to 5% more), 4 "slightly more" (6 to 15% more), and 5 "significantly more" (more than 15%). Respondents could also check "NA" for not applicable, and "NR" for not important to you.

Among the other significant results of the survey is the acceleration of a multi-year trend which each year predicts more R&D effort will be expended in the subsequent year to respond to legislation, standards or other governmental rules. Forty eight percent of the current respondents forecast such an increase in 1991, vs. 38% in last year's survey and 28% in the previous year.

Table 2. Survey Questionnaire Results

Expected Changes in 1991 Compared with 1990 Experience	Relative Change (Number of Responses) NA	1	2	3	4	5	NR
Expenditures							
1. Total R&D expenditures	0	4	18	59	54	2	0
2. Ratio of direct salaries and wages to other direct R&D costs	0	0	13	108	14	0	1
3. Capital spending for R&D operations	0	13	31	55	28	9	0
4. Subcontracting R&D to outside commercial organizations	12	3	18	78	21	0	3
5. Grants, contracts, etc. for university R&D	4	4	20	79	24	4	1
Effort Allocation							
6. Relative distribution of R&D costs:							
a. Support of existing business	1	1	15	80	33	6	1
b. Directed basic research*	11	7	31	70	18	0	1
c. New-business projects	1	9	19	52	47	6	2
7. Ratio of non-centralized (e.g., divisional) to centralized corporate R&D efforts	21	1	10	80	20	1	4
8. Outside-customer technical-service efforts relative to total R&D (in time or dollars)	8	0	11	82	31	1	2
9. R&D efforts in response to existing or proposed legislation, standards, or other governmental rules (in time or dollars)	5	1	0	66	52	9	1
Personnel Trends							
10. R&D professional manpower level	0	6	26	73	31	1	0
11. Hiring new graduates	5	8	18	70	24	1	0
Other Trends							
12. Top management attention to Research on longer term or strategic issues	1	8	13	51	59	6	0
13. Top management attention to Development	0	1	6	54	69	6	0
14. Participation in consortia for pre-competitive university research	14	8	17	78	17	0	1

(Continued)

Table 2 (continued)

Expected Changes in 1991 Compared with 1990 Experience	Relative Change (Number of Responses)						
	NA	1	2	3	4	5	NR
15. Participation in alliances and joint ventures for R&D	6	2	8	66	45	9	0
16. Licensing technology from others (dollar volume)	9	2	9	83	25	5	1
17. Licensing technology to others (dollar volume)	10	2	8	80	29	3	1
18. Extent of government financial support of R&D	41	1	18	53	13	1	5
19. Contacts with Federal Laboratories	30	2	5	66	23	4	2
20. Overhead costs	1	3	21	84	25	1	0

Quantitative Data

21. What is your capital expenditure for R&D as a percent of your R&D Budget?
    1989 13.1%; 1990 15.4%; 1991 15.2%
22. R&D expenditures as percent of sales: 1990 4.7%; anticipated for 1991 4.7%
23. R&D professionals as a percent of total R&D personnel: 1990 57%; anticipated for 1991 57%
24. Operational costs per R&D professional**
    a. for 1990 $158,500
    b. estimate for 1991 $162,700

*Research whose outcome may be unknown at the time the work is undertaken but where there's a reasonable expectation that findings will be valuable to the supporting organization.

**Refers to the actual cost of operating the laboratory. Numerator consists of such costs as salaries (professional and non-professional), fringe benefits, travel, training, supplies, secretarial, managerial, analytical and testing services in-house and outside, utilities, taxes, and depreciation. Denominator includes total number of technical professionals at the laboratory, whether in technical or managerial activities.

Another multi-year trend which will continue into 1991 is the expected increase in the R&D participation in alliances and joint ventures. Forty two percent of this year's respondents expect such an increase in 1991, vs. 33% last year and 40% the previous year. Only 8% expect a decrease.

In the area of licensing technology to and from others, modest increases are expected in both directions. The out-licensing expectations continue a multi-year trend, whereas the expectation of increased in-licensing represents a departure from the previous two years.

Some increases are also expected in contacts with Federal Laboratories. This is continuation of a three-year trend and could indicate a continuing positive response to legislation encouraging the transfer of technology from Federal laboratories to industry.

Participation in consortia for pre-competitive university research, however, is decreasing slightly, with 8 respondents indicating they expect to do significantly less in 1991. This parallels the expected decline in basic research support and may also be indicative of the shifting R&D priorities toward a greater business focus.

No dramatic changes are predicted in R&D professional manpower levels or in expectations for hiring new graduates. The 23% of respondents predicting manpower increases was offset by the same precentage predicting reductions. Similarly, the 21% of the respondents who predict hiring increases in 1991 matched a similar percentage of respondents who anticipate decreases. This year's predictions parallel last year's but mark a decrease from the optimistic hiring expectations of two years ago.

Overall quantitative data do not predict any surprising changes from 1990 to 1991. Capital expenditures are expected to remain about the same as 1990 (15.2% vs. 15.4% of R&D budget), and R&D expenditures are expected to remain at 4.7% of sales, the same as in 1990. The operational costs per R&D professional are expected to be $162,700 in 1991, an increase of 2.6% over 1990.

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